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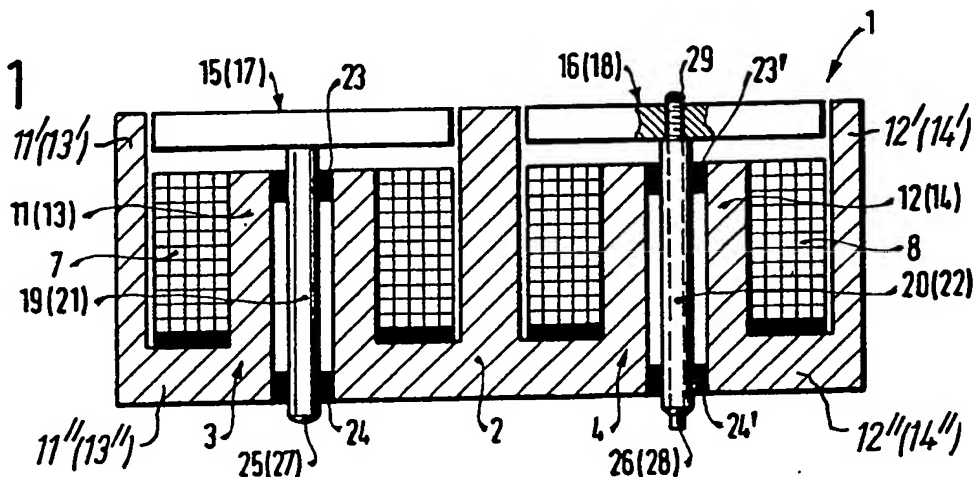
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(25-28).

(54) Multiple unit electromagnetic assembly

(57) An electromagnet assembly comprises a plurality of magnetic circuits (3, 4) combined as a unit in a single housing (2). The housing (2) and coil carriers (11, 12, 13, 14) are either manufactured integrally from sintered material or they comprise a single profiled body. Each magnetic circuit comprises the coil carriers (11-14), yokes (11'-14'), base plates (11''-14'') and sliding armatures (15-18) having valve-actuating push rods

FIG. 1



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FIG. 1

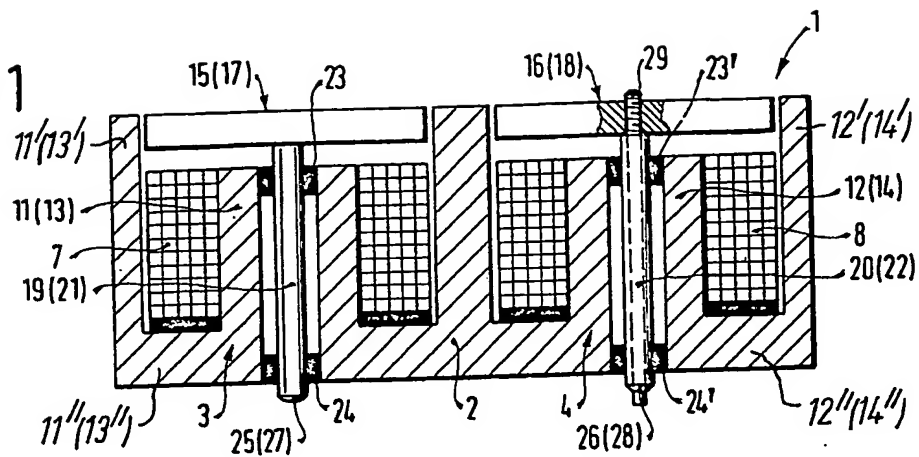


FIG. 2

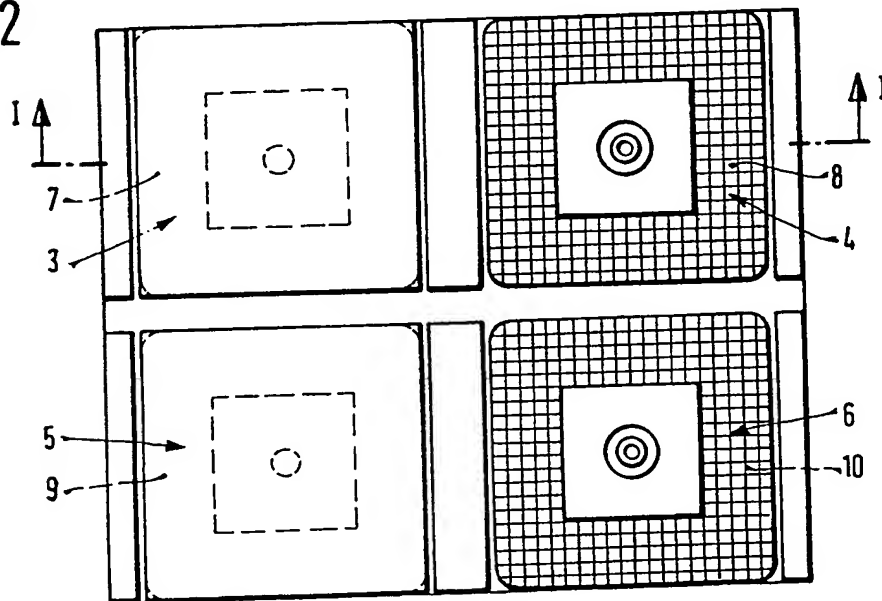


FIG. 3

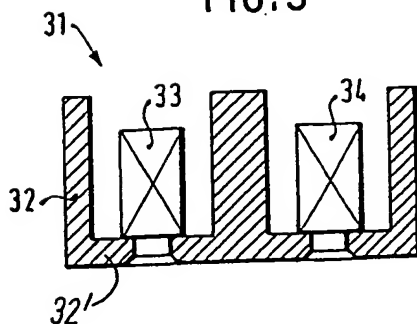
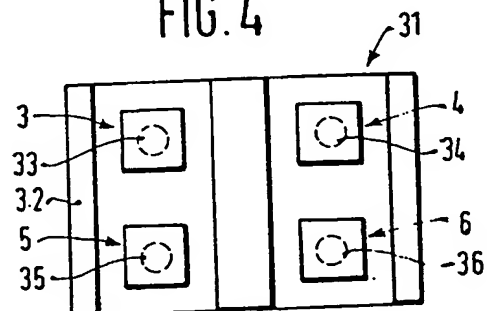


FIG. 4



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SPECIFICATION

Electromagnet assembly

- 5 The invention relates to electromagnet assemblies.

An electromagnet assembly having a plurality of flux paths defined in a common housing is described in German Patent Specification (Auslegeschrift) No. 26 48 142. The electromagnet assembly in this known construction comprises individual electro-magnets whose housings are screwed into a valve housing. It is a complicated and expensive matter to manufacture an assembly of this kind. Furthermore, adjustment is time-consuming.

- The invention resides in an electromagnet assembly comprising a common housing, a plurality of magnet coils, and a plurality of magnetic circuits in the housing, each magnetic circuit being formed by a respective coil carrier, a respective part of the common housing and a respective armature disposed at least partially within that coil carrier, said coil carriers and said housing parts being of a magnetically conductive material and a respective one of the coils being disposed on each coil carrier.

- This has the advantage that a plurality of magnetic flux paths or circuits can be arranged very inexpensively in a single sintered or profiled part. A sintered part has the advantage that the part can be manufactured true to size without finishing.

- The cost of manufacture is also low when the part is manufactured as a profiled part, since, in contrast to a plurality of individual magnetic circuits, the finishing costs are only incurred once. By way of example, the part has to be clamped only once for manufacture and assembly. In addition to this, assembly is simplified, securing is facilitated and adjustment is less complicated.

- Furthermore, it is also advantageous that the electromagnet assembly can be preassembled and adjusted in its entirety before it is fitted to a valve assembly of the like to be actuated or controlled thereby.

- Finally, it is advantageous that the individual magnetic circuits do not influence one another, despite the compactness of the electro-magnets, because some of the magnetically conductive parts, the coil carriers for example, are considerably spaced from one another, and that the amount of material used is low, which has an advantageous effect on the weight.

- The invention is further described, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 is a sectioned side elevation of a sintered electromagnet assembly,

Figure 2 is a partially sectioned plan view of the electromagnet assembly of *Fig. 1*,

electromagnet assembly in the form of a profiled body, and

Figure 4 is a plan view of the electromagnet assembly.

- 70 Referring first to *Figs. 1* and *2*, an electromagnet assembly 1 has a common housing 2 which is manufactured in one piece from sintered material. The sintered material is magnetically conductive for the magnetic flux.
- 75 The assembly 1 is equipped with four magnetic flux paths or circuits 3, 4, 5 and 6, each comprising a magnetically conductive coil carrier 11, 12, 13, 14, a magnetically conductive yoke 11', 12', 13', 14', a magnetically conductive base plate 11'', 12'', 13'', 14'', and an armature 15, 16, 17, 18. The magnetically conductive coil carriers 11, 12, 13 and 14 and the magnetically conductive yokes 11', 12', 13', 14' are integrally formed
- 85 on the respective magnetically conductive base plates 11'', 12'', 13'', 14'' to form integral parts of the common housing 2. The magnetically conductive coil carriers 11, 12, 13, 14 and the magnetically conductive yokes 11', 12', 13', 14' are arranged to extend to the same side of the base plates. Four coils 7, 8, 9, 10 are mounted on the coil carriers 11, 12, 13, 14.

- Each armature 15, 16, 17 and 18 is of T-shaped construction (in section) and has a respective guide member 19, 20, 21, 22 which is mounted in two bushes 23 and 24 or 23' and 24'. Each guide member 19, 20, 21 and 22 extends through the housing 2 and its other end is in the form of a push rod 25, 26, 27, 28 for a pressure medium control valve (not illustrated), a pusher, or a slide valve which is disposed in a valve housing (also not illustrated). Each armature 15, 16, 17, 18 is movable independently of the others.

- Furthermore, *Fig. 1* shows that there is fitted in the guide member 20 of the armature 16 a screw 29 by means of which the effective length of the push rod 26 can be varied in order to adjust the electromagnet assembly 1.

- The magnetically conductive coil carriers 11, 12, 13, 14 can also be unitised or standardised in a manner similar to that of the magnetic circuits 3, 4, 5 and 6 and can be mounted on a common carrier plate which can than be, for example, a printed circuit board, or alternatively, a plastics structure having upright grilles. It is then a particularly simple matter to effect the electrical wiring.

- Figs. 3* and *4* show another embodiment of an electromagnet assembly 31. The electromagnet assembly 31 has a housing 32 manufactured as a profiled body by, for example, a forging operation. A coil carrier 33, 34, 35 and 36 of magnetically conductive material and intended for each magnetic circuit is manufactured separately and is secured to a

material and forming part of the housing 32 in a positive manner by, for example, peening-over or, alternatively, by soldering or welding. The electromagnet assembly 31 otherwise largely corresponds to the electromagnet assembly of Fig. 1 and therefore has the same reference numerals for the same parts.

By virtue of the described combination of the magnetic circuits 3, 4, 5, 6, the electromagnet assembly 1, 31 can be manufactured considerably less expensively than other known constructions. There is a considerable reduction in the number of individual parts. Moreover, the assembly 1, 31 can be secured in a simpler manner and can be assembled more readily and adjusted more rapidly than the assembly known from the prior art. It is thereby achieved that the individual magnetic circuits do not influence one another despite the small distances therebetween. Also the amount of material used and the weight are very low.

The electromagnet assembly 1, 31 is usable preferably in anti-skid control valves of motor vehicles, since conventional solenoid valves constitute a high cost factor when used for this purpose.

However, it is also conceivable to use it for electrical transmission controls or the like. Finally, unitary magnetic circuits are advantageous for the combination of hydraulic and pneumatic valves. It is also conceivable to use them for solenoids for, for example, the actuation of relays.

CLAIMS

1. An electromagnet assembly comprising a common housing, a plurality of magnet coils, and a plurality of magnetic circuits in the housing, each magnetic circuit being formed by a respective coil carrier, a respective part of the common housing and a respective armature disposed at least partially within that coil carrier, said coil carriers and said housing parts being of a magnetically conductive material and a respective one of the coils being disposed on each coil carrier.

2. An electromagnet assembly as claimed in claim 1, in which the said parts of the common housing and the individual coil carriers are integrally manufactured from sintered material.

3. An electromagnet assembly as claimed in claim 1, in which a magnetically conductive base plate of the common housing is manufactured as an integral profiled body, and various additional magnetically conductive parts comprising the individual coil carriers are secured to positively to this profiled body.

4. An electromagnet assembly as claimed in claim 1, 2 or 3, in which the magnetically conductive coil carriers are standardised and are mounted on a common magnetically conductive base plate.

5. An electromagnet assembly as claimed

in any of claims 1 to 4, in which the magnetically conductive parts are disposed adjacent to one another.

6. An electromagnet assembly as claimed in any of claims 1 to 5, in which one or a plurality of the armatures is (are) adjustable by a screw which is disposed coaxially in the armature.

7. An electromagnet assembly as claimed in any of claims 1 to 6, in which the housing is assembled onto housings of pressure medium control valves which are actuatable by the electromagnet assembly by way of push rods.

8. An electromagnet assembly as claimed in any of claims 1 to 6, in which the housing is assembled with housings of pushers which are actuatable by the electromagnet assembly by way of push rods.

9. An electromagnet assembly as claimed in any of claims 1 to 6, in which the housing is assembled onto housings of slide valves which are actuatable by the electromagnet assembly by way of push rods.

10. An electromagnet assembly as claimed in any of claims 1 to 9, which is assembled with an anti-skid control valve assembly for actuating individual valves thereof.

11. An electromagnet assembly, constructed substantially as herein described with reference to and as illustrated in the accompanying drawings.

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